

The Role of the Non-Dominant Hand in Bilateral Artmaking and Effects on Anxiety

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Master of Arts in Art Therapy and Counseling (MAATC)

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Institutional Review Board (IRB)
Albertus Magnus College

DATE: March 9, 2022

Dear Marissa Ferrao,

This letter serves as an official approval by the Albertus Magnus College IRB for you to conduct the study on "bilateral artmaking and anxiety" as described in the IRB application submitted on 3/7/22. However, the reviewer stated that you should consider the following comments about your study:

- The Zung scale does not measure physiological responses. It is a self-report inventory. No physiological measures are described.
- If the researcher intends to use scores on the GAD as a covariate (not "correlate") this should be reflected in the data analysis plan.
- Since the Zung is being modified, presumably the data analytic plan includes computation of its reliability.

We strongly encourage you to consider the comments above. Also, please ensure that the confidentiality of your research participants is properly protected and that you remain within the boundaries you stated in the IRB application. If those boundaries change in relation to the study participants, please notify the IRB as an amendment may be necessary.

Your study is authorized to begin as of the date of this approval letter and is valid for one year, ending on March 9th, 2023.

If you have any questions, please contact Dr. Joshua Abreu, the IRB Administrator, by e-mail at jabreu1@albertus.edu.

Sincerely,

Joshua Abreu, Ph.D.
IRB Administrator

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Interim Director, Professor and Clinical Coordinator

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Reader: Ragaa Mazen, Ph.D., NCC

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Abstract

The present study investigated if bilateral (using both hands) is more effective than single handed artmaking in producing clinical outcomes and if the mechanism for this effect is the engagement of both hemispheres of the brain associated with non-dominant hand use. Participants ($N = 35$), ranging in age from 18-67 years, were systematically assigned to one of three conditions: non-dominant hand, dominant hand, and bilateral scribble drawings. It was hypothesized that all conditions would experience a decrease in anxiety, but the non-dominant single hand and bilateral conditions would have a greater impact on anxiety reduction than the dominant single hand condition. The participants completed the Generalized Anxiety Disorder 7 (GAD-7) and Zung Self-Rating Anxiety Scale (SAS) pre- and post-artmaking. Results show a significant reduction in anxiety for only the bilateral drawing condition with a medium effect size ($d = 0.54$). The non-dominant hand condition shows the least change in anxiety, which could suggest participants feeling loss of control in the artmaking process. Findings provide initial supporting evidence that bilateral artmaking is more effective than single handed artmaking but needs to be replicated. Assumptions in the literature concerning the mechanism for this effect are not supported and need further research. Sample drawings are analyzed and implications for future research and clinical practice are discussed.

The Role of the Non-Dominant Hand in Bilateral Artmaking and Effects on Anxiety

Anxiety is a normal emotion that often arises during moments of stress and has various cognitive and physical symptoms that differ by individual (National Institute of Mental Health, 2018). Experiencing anxiety becomes a disorder when the symptoms occur over an extended period and impair one's functioning in daily life (American Psychiatric Association, 2013). With anxiety disorders affecting more than 18.1% of the population every year, they are the most common mental illness in the United States (Anxiety and Depression Association of America, 2021). Anxiety disorders often co-occur with other disorders, such as depression, and can lead to suicide when left untreated. There is a wide range of treatment options provided for those living with anxiety disorders. Due to advances in brain imaging, research has been able to examine neurological functioning as it pertains to alleviating anxiety.

Engel et al. (2009) conducted a meta-analysis that focused on anxiety disorders. They reviewed both animal and human neuroimaging studies on panic disorder, agoraphobia, social anxiety disorder, generalized anxiety disorder (GAD), and specific phobia. Structural and functional imaging procedures were used to evaluate participants' brain activity under specific, controlled conditions, such as fear-conditioning paradigms and anxiety provocation tests. They hypothesized that across studies there would be evidence of complex anxiety networks in the human brain. The researchers found that individuals with anxiety disorders show abnormalities in the prefrontal cortex. Brain imaging evidence also supported the theory that there is a distinction between two categories of anxiety disorders. The images showed hypoactivity in the prefrontal cortex, disinhibiting the amygdala in persons with anxiety disorders involving intense fear and panic, while there was hyperactivity in the prefrontal cortex in individuals with anxiety disorders involving worry and rumination.

Makovac et al. (2016) conducted a study investigating the relationships in symptoms of worry, rumination, and heart rate variability with brain activity using resting-state functional magnetic resonance imaging (fMRI) in participants with GAD ($n = 19$) and control participants ($n = 21$). The participants completed a sociodemographic and lifestyle questionnaire with measures of stress-reactive rumination, depressive rumination, and worry. During the fMRI procedure, participants went through a series of resting-state periods followed by a visuomotor tracking task. At random intervals, the participants listened to a recorded verbal anxiety induction procedure designed to induce perseverative thoughts of worry and rumination and then rated their thoughts using a visual analog scale. Before the induction procedure, participants with GAD showed relatively lower connectivity between the amygdala and the prefrontal cortex than controls. Following the induction procedure, connectivity patterns between the amygdala and prefrontal cortex increased in participants with GAD and decreased in control participants. The results of this research support the hypothesis that core symptoms of worry and autonomic dysfunction in GAD stem from a shared basic neural mechanism.

Comparatively, Park and Moghaddam (2018) reviewed animal and human neurophysiological and neuroimaging studies. Their findings suggest that anxiety disorders contribute to deficits in the prefrontal cortex, which may have a negative effect on decision making and behavioral flexibility when faced with stressful and unpredictable changes. This supports the idea that perseverative thoughts caused by stressful stimuli can debilitate effective cognitive and behavioral responses in individuals with GAD.

These findings contrast with studies on handedness and interhemispheric interaction. Researchers propose there is an association of increased right hemisphere activity during rest state and negative affect in ambidextrous individuals who may be more prone to mental illness

(Propper et al., 2012; Shobe et al., 2009). Ambidextrous individuals may also be more creative and self-reflective than those with a preferred dominant hand who would be more likely to self-ruminate (Niebauer, 2004).

Several studies have explored the effects of handedness on neural substrates and results suggest that handedness is associated with brain activity in the human motor cortex and there are differences in sensorimotor activity and connectivity between right-handers and left-handers (Amunts et al., 1996; Andersen & Siebner, 2018). The dominant hand in right-handed individuals is mainly controlled by the left hemisphere while the non-dominant hand is controlled by both left and right hemispheres (Gut et al., 2007).

A treatment for anxiety and post-traumatic stress disorder (PTSD) that involves brain function is Eye Movement Desensitization and Reprocessing (EMDR). Shapiro (2007) developed EMDR protocols that focus on the use of both sides of the brain. The author suggested that the stimulation of the right and left hemispheres of the brain activates the brain's information processing system and memory network. Using EMDR protocols, clients are guided to adaptively assimilate a distressing memory within the larger memory network. Shapiro stipulates that this method of activation allows for heightened insight, the surfacing of new memories, and the replacement of negative emotions connected to the specific memory with positive ones.

Chen et al. (2014) investigated the effects of EMDR therapy on people with PTSD, conducting a quantitative meta-analysis of 26 randomized studies. The researchers hypothesized that EMDR treatments would significantly reduce symptoms of PTSD, depression, and anxiety. Numerous psychological measures were used in the studies and data showed that EMDR significantly reduced symptoms for all three disorders. The researchers concluded that because

EMDR therapy reduced anxiety and depression, the treatment makes way for positive emotions that could improve one's self-awareness, beliefs, and behaviors.

An equally important form of treatment for anxiety that has emerged over the past 20 years is the use of mind-body awareness techniques, such as mindful breathing, meditation, and progressive muscle relaxation. These techniques have been incorporated into several treatment approaches, including mindfulness-based stress reduction, mindfulness, biofeedback, yoga, and hypnosis, aimed at increasing wellness. Mind-body practices are an important component in the reduction of both psychological and physiological symptoms of anxiety (Fulweiler & John, 2018; Goldin & Gross, 2010) which might also be exhibited in the art products of those who seek therapy.

Art therapy is a profession that integrates mental health and creative processing of conscious and unconscious art content within a psychotherapeutic relationship. Czamanski-Cohen and Weihs (2016) proposed a model through which mind-body practices are activated by art therapy treatment, speculating an emergence of reorganization, growth, and reintegration of the self, and establishing a framework for future research in art therapy and mind-body practices. This model is based on the notion that artmaking taps into the unconscious, which plays an important role in art therapy treatment. Connections between mind and body can also be determined through the use of art therapy assessment tools which offer another layer of understanding the individual. Along with unconscious symbolism and mindfulness practices that link to somatic language, art therapists can also examine the structural aspects of imagery created in therapy. Formal elements of the art including line quality, space usage, and prominence of color (to list a few) can be reviewed directly in the art product (Gantt, 2001) using the rating manual for the Formal Elements Art Therapy Scale (Gantt & Tabone, 2012) which was initiated

by Linda Gantt and further developed with Paula Howie starting in 1979 (Gantt, 2001). Building on current neurological research, Gantt and Tinnin (2009) suggested that art therapy may be effective for individuals with trauma because artmaking helps to access nonverbal and emotional neurobiological responses when verbal communication processes are not accessible. Viewing artwork through these varied lenses may help clients access and integrate parts of self that may be inhibited by defense mechanisms.

King (2016) posited that the healing effects of art therapy are improved by bilateral stimulation, the use of both hands in artmaking, and mind-body connectedness. Traditionally, art therapists only orient to clients' dominant hands in artmaking, only sometimes encouraging the use of both hands either simultaneously or asynchronously. However, because use of the non-dominant hand involves both left and right hemispheric brain activity (Gut et al., 2007), it could be beneficial for the field of art therapy to explore primary use of the non-dominant hand in artmaking.

Bilateral artmaking is a neurologically based art therapy process described by McNamee (2003; 2004a; 2005), as the use of both one's dominant and non-dominant hands in artmaking. The purpose of this author's work has been primarily to describe a bilateral art protocol and provide rationale for the use of bilateral art in art therapy. McNamee believes that bilateral art may be key in integrating brain hemispheres using both hands and multiple sensory systems, such as vision, touch, and pressure.

Scribble drawing lends itself well to bilateral artmaking. Typical protocol encourages clients to use either hand or both hands when scribbling. McNamee's (2004b) research was designed to engage the functions of the left-brain hemisphere for language and speech and the right-brain hemisphere for visual-motor activities through scribble drawings. The goal of this

case study was to integrate both verbal and nonverbal therapy for a client living with severe anxiety and depression. The nonverbal therapy used was annotated scribble drawings. This is accomplished by making random and abstract lines typically without lifting the drawing material from the paper. After one completes a scribble, annotation is done by using different colored drawing materials to enhance imagery that comes forward when stepping back to observe the work. In McNamee's case study, the client was encouraged to use either hand while drawing. The drawings then served as stimuli for verbal discourse with the client. The author suggested that the use of metaphor facilitated a sense of safety and distance for the client from their identified experience and promoted understanding. It was concluded the client successfully responded to this form of treatment due to integrating the left and right brain hemispheres through verbal and nonverbal expressions.

In subsequent work, McNamee (2006) explored the use of bilateral artmaking as an intervention that could be used to disrupt maladaptive neural organization. The goal of this research was to provide rationale for the use of bilateral artmaking in the treatment of relationship issues, depression, anxiety, and trauma. Using a pre-post design, the research was a retrospective analysis of work with clients over an 18-month period. There were 31 sessions reviewed, but only 16 rated their cognitions pre- and post-intervention. The intervention was not the same experience for each client as it developed over time. Some participants used both hands asynchronously, assigning a different hand to their logical and distorted cognitions, while others were asked to incorporate the use of both hands at some point during the intervention. Additionally, the intervention was not experienced the same number of times by each client. Clients ($N = 12$) engaged with a protocol of bilateral artmaking that used large white paper with a line drawn down the middle and markers or oil pastels. Clients were asked to first identify an

experience and write down logical and distorted cognitions about that experience. There were no instructions on how many cognitive elements to write down, and no details were stated on whether clients matched their logical cognitions with their distorted cognitions. They rated the trueness of their cognitions using a Likert-type scale before and after artmaking, and the participants reflected on the experience through writing and/or drawing.

McNamee (2006) compared pre- and post-intervention trueness scores, handedness in association with the logical and distorted cognitions, color selections associated with the cognitions, and changes in behavior that were observed and documented by the therapist in following sessions. It was found that the strength of belief in, or trueness of, the distorted cognitions decreased in all the cases but did not for logical cognitions, supporting the hypothesis that strength of belief would change more for distorted cognitions than logical cognitions. A review of case notes showed positive changes in behavior and beliefs related to the drawn experiences over time. The design of the study, however, did not allow for drawing any conclusions on handedness. The researcher concluded that bilateral art is an effective therapeutic intervention but acknowledged there are limitations to what can be claimed.

In a pre-post design, Burgess (2009) explored the effects of bilateral artmaking on the reduction of depression and negative mood by having college students ($N = 16$) complete an adaptation of McNamee's bilateral art protocol. It was hypothesized that after completing the protocol, participants would show a reduction in depression, increased positive mood, and decreased negative mood. Results showed decreases in levels of depression for all participants. However, there were also decreases in positive affect scores, conflicting with the hypothesis. The researcher concluded that while the bilateral art protocol could be an effective therapeutic intervention, the protocol itself is highly individualized to each participant, and the amount of

time it took for participants to complete the protocol and the measures could have contributed to fatigue and a decrease in positive affect.

A common form of bilateral artmaking is the use of clay as the primary medium. Tardif (2015) conducted a comparative study on the effects of clay-work and a one-handed drawing task on anxiety. Due to its inherently bilateral nature, the researcher hypothesized that clay-work would have a greater reduction in anxiety than a one-handed drawing task. College students ($N = 45$) were randomly assigned to one of two conditions, clay or drawing. They completed the State Trait Anxiety Inventory (STAI) before and after artmaking. Clay-work was found to have a significantly greater reduction of state-anxiety, but the one-handed drawing task reduced both state and trait anxiety. The author concluded that clay-work may help to reduce more immediate symptoms of anxiety, while one-handed drawing tasks may aid in the therapeutic reduction of trait-anxiety on a more long-term basis. However, it is important to note the confound of using such different mediums as considered through the lens of the expressive therapies continuum (ETC; Lusebrink & Hinz, 2016). As noted, clay is inherently bilateral as it is typically worked through using both hands. However, as seen through the lens of the ETC, clay is a loose material that is less easy to control, messier, and theoretically evokes a regressive or emotional response due to accessing the reptilian brain and unconscious mind. Conversely, according to the ETC, using a pencil is more structured which tends to keep artmaking, and therefore processing, in a conscious, cognitive, and symbolic state.

The literature suggests that bilateral artmaking may be useful in reducing anxiety. McNamee (2006) and King (2016) suggest there is added value in achieving therapeutic outcomes by using both hands in bilateral artmaking, whether simultaneously or asynchronously. However, this could instead be due simply to the inclusion of the non-dominant hand, which has

been shown to involve both the right and left hemispheres (Gut et al., 2007) and be associated with affect and creativity (Niebauer, 2004; Propper et al., 2012; Shobe et al., 2009).

While prior researchers (e.g., King, 2016; McNamee, 2006) suggest bilateral artmaking has a greater impact on therapeutic outcomes than traditional one-handed artmaking, research has not tested this assumption or the mechanism by which bilateral artmaking would have greater effectiveness (i.e., requires use of the non-dominant hand or because of using both hands). The goal of this present study was to tease out the role of the non-dominant hand versus the dominant hand in bilateral artmaking, and their effects on anxiety. This study had three artmaking conditions: a non-dominant hand drawing group, a dominant hand drawing group, and a bilateral drawing group. There were two measures of anxiety. The Zung Self-Rating Anxiety Scale (Zung, 1971) was used to measure change pre- and post-intervention because it is more sensitive to detecting change in physiological symptoms. The General Anxiety Disorder 7 (Spitzer et al., 2006) was used only at pretest as a possible correlate to response to the intervention.

While it was expected that participants across all conditions would experience reduced anxiety levels, it was hypothesized that participants who make art with their non-dominant hand as well as those in the bilateral condition would show a greater decrease in anxiety after artmaking compared to those using only their dominant hand. It was also hypothesized that there would be no significant difference in change of anxiety levels between participants in the non-dominant hand and bilateral conditions.

Method

Participants

Adult participants ($N = 35$) ranging in age from 18-67 years ($M = 34.31$, $SD = 15.43$) were recruited as a sample of convenience. To create a snowball sampling effect, a recruitment

flyer (Appendix A) was shared via email, text messaging, and posted on social media and at a small, private Southern New England college campus, where the study was primarily conducted. All efforts were made to gather participants with diverse backgrounds. There were 21 women, 13 men, and one self-described genderfluid participant. The races and ethnicities of participants included White/Caucasian (31.4%), Hispanic/Latinx (28.6%), African American/Black (22.9%), mixed race ($n = 5$, 14.3%), and Asian/Asian American ($n = 1$, 2.9%). Participants were asked how frequently they make art, with most participants answering rarely (37.1%) and never (31.4%) and the rest occasionally (20%) and frequently ($n = 4$, 11.4%). Everyone was self-described right-hand dominant except for one person who was removed from the analysis to keep the sample purely right-handed.

Measures

Zung Self-Rating Anxiety Scale

The Zung Self-Rating Anxiety Scale (SAS; Zung, 1971) is a 20-item self-report measure of anxiety that asks participants to indicate how often within the past week they have experienced symptoms of anxiety, such as “I get upset easily or feel panicky,” “I am bothered by headaches, neck and back pain,” and “I feel weak and get tired easily.” The four responses on the Likert-type scale include: 1 = *None OR A little of the time*, 2 = *Some of the time*, 3 = *Good part of the time*, and 4 = *Most OR All of the time*. Items worded symptomatically positive are reverse scored. Scoring is calculated by adding the values of the 20 items for a raw score ranging from 20-80. To obtain an index score, the raw score is divided by the maximum score of 80 and then multiplied by 100. According to Dunstan et al. (2017), an index score of 25-44 suggests a normal range of anxiety, while 45 and above suggests clinically significant anxiety. They note that while higher scores are assumed to indicate greater severity of anxiety, Zung (1971) did not publish

score ranges for degrees of severity. Zung's research shows the SAS has a strong split-half correlation ($r = .71$) for even and odd items, as well as a fair concurrent validity when correlated with the Taylor Manifest Anxiety Scale ($r = .30$). For the purposes of this study, the researcher modified the written instructions on the Zung SAS for participants to report on symptoms experienced "*at this present moment*," rather than "*within the past week*." The scale descriptors were also modified to reflect intensity rather than frequency of symptoms and changed to the present tense: "*None or a little true*," "*Mildly true*," "*Moderately true*," and "*Severely true*."

General Anxiety Disorder 7

The General Anxiety Disorder 7 (GAD-7; Spitzer et al., 2006) is a seven-question scale that measures anxiety severity, requiring participants to record how often they have been bothered by problems, such as, "Feeling nervous, anxious, or on edge," in the last two weeks. Participants answer seven questions using a Likert-type scale of 0 = *Not at all* to 3 = *Nearly every day*. Then, participants answer the question: "*If you checked any problems, how difficult have they made it for you to do your work, take care of things at home, or get along with other people*," by selecting one of four options between, "*Not difficult at all*" to "*Extremely difficult*." Scores are summed for the first seven questions. Total scores can range from 0-21, with a score of 0-4 indicating minimal anxiety, a score of 5-9 indicating mild anxiety, a score of 10-14 indicating moderate anxiety, and a score of 15-21 indicating severe anxiety. The last question is used for understanding the overall effect anxiety has on one's ability to function and is not calculated into the total score. A study by Johnson et al. (2019) found the GAD-7 to be reliable ($\alpha = .88$) and valid with a high positive correlation ($r = .69$) with the Beck Anxiety Inventory.

Materials

For making the art, a sheet of 11 in. x 14 in. (27.9 cm x 39.6 cm) Canson® XL® white drawing paper and a 12-piece set of Faber-Castell® oil pastels were provided to the participants. The participants were also provided with a sheet of 18 in. x 24 in. (45.7 cm x 61 cm) newsprint paper to protect the table surface and masking tape to hold the paper in place while artmaking.

Procedure

Participants were systematically assigned to a group of about four to six people in one condition and then subsequent volunteers assigned to a group in the next condition until all conditions filled: dominant hand drawing ($n = 11$), non-dominant hand drawing ($n = 12$), and bilateral drawing ($n = 12$). Most sessions were held in college campus quiet meeting spaces (e.g., conference rooms). All participants were provided an informed consent form (Appendix B) and an art image release form (Appendix C) that they read, signed, and returned to the researcher while retaining copies of each for themselves. They were then asked to complete the GAD-7 and then the pretest Zung SAS which they returned to the researcher once completed.

Once all preliminary forms were completed and returned to the researcher, the artmaking began. All participants were directed to tape the newsprint paper to the table and the white drawing paper to the newsprint in whatever orientation they liked. The dominant and non-dominant hand drawing groups were given the following directive: “Please stand if able to or sit up tall and at about elbow’s length away from your table. Create a scribble drawing, which is a drawing only made up of scribbling on the page. Use only the hand that you have been assigned to use. Remember, your artistic skills are not of any concern. You may use as many colors as you like. Please try to use as much of the paper as you can in 10 minutes.” If it came up, those who identified as ambidextrous were told to use the hand they consider their dominant or non-

dominant hand when writing or artmaking, depending on the condition they were assigned to. Participants in the bilateral drawing condition were given the same directive, but instead with instruction to use both their hands “simultaneously, or at the same time” to create the scribble drawing. Participants had 10 minutes to complete the artmaking portion of the study.

Following the artmaking, participants completed the post-test Zung SAS and a demographics form (Appendix D). Once they returned their completed materials to the researcher, participants were then provided a debriefing form (Appendix E). Artwork was collected, and photographs of the artwork were taken by the researcher for research purposes. All collected materials were assigned identification numbers to protect confidentiality and stored in private and secured locations. Electronic data was stored on a password protected device. All consent and art release forms were stored in a private and secured location separate from the data. Artworks will be returned to any participants who request it now that the research is completed.

Results

Reliability analyses were done on each of the scales to determine reliability for the current sample and to make sure making minor modifications to the wording of the Zung anxiety measure did not substantially weaken reliability. The Zung SAS pretest has a modest reliability ($\alpha = .61$) while the post-test has a good reliability ($\alpha = .71$). The GAD-7 has very good reliability ($\alpha = .85$). Descriptive statistics for all measures pre- and post are presented in Table 1.

To test the hypothesis that there would be a decrease in anxiety from pretest to post-test, paired samples t-tests were conducted for each of the conditions. In partial support of the hypothesis, each condition shows a decrease in anxiety with pretest scores being slightly higher than post-test scores (see Figure 1). The change ($M = 1.92$, $SD = 3.55$) in anxiety for the bilateral

drawing condition from pre ($M = 34.83, SD = 6.51$) to post ($M = 32.92, SD = 4.83$) is statistically significant $t(11) = 1.87, p = .044$, with a medium effect size of $d = 0.54$ (Cohen, 1988). Change in anxiety within the other two conditions is not significant (see Table 2). To determine if the decrease in anxiety for the dominant hand drawing condition was significantly smaller than in the other conditions as hypothesized, a one-way ANOVA was conducted. The one-way ANOVA results show that the differences among groups is not statistically significant $F(2, 32) = 0.10, p = .910$ (see Table 3). Thus, the hypothesis that both the non-dominant hand and bilateral drawing conditions would show greater reduction in anxiety compared to the dominant hand drawing condition is not supported. The non-dominant hand drawing condition shows the least amount of change in anxiety compared to the other two conditions, with the bilateral drawing group having the highest reduction in anxiety pre- to post-test.

Exploratory Pearson r correlation analyses for the entire sample were conducted to better understand change in anxiety after artmaking. There is no correlation between reports of how frequently participants make art and amount of change in anxiety ($r = -.09, p = .592, N = 35$, two-tailed). There is a small negative correlation ($r = -.21, p = .255, N = 31$, two-tailed) showing that the more difficulties one reports due to their anxiety symptoms, the greater the anxiety reduction after artmaking; though, this correlation is not statistically significant. There is, however, a statistically significant negative correlation ($r = -.38, p = .023, N = 35$, two-tailed) showing that the higher one's GAD-7 generalized anxiety score is, the more anxiety reduces pre-to post-intervention. There is also a significant positive correlation ($r = .44, p = .014, N = 31$, two-tailed) between the experience of difficulties due to one's anxiety and the severity of one's generalized anxiety.

Discussion

This research study examined the role of the non-dominant hand versus the dominant hand in bilateral artmaking and their effects on anxiety. The results partially supported the hypothesis. The bilateral drawing condition had the highest reduction in anxiety pre- to post-test. However, the hypothesis that the non-dominant hand drawing condition would have a greater effect on anxiety reduction than the dominant hand drawing group was not supported. Decreases in anxiety for the dominant hand drawing and bilateral drawing conditions were more closely related compared to the non-dominant hand drawing condition.

These results support literature that suggests that bilateral artmaking is more effective in impacting clinical outcome (e.g., Burgess, 2009; King, 2016; McNamee, 2006). The results, however, do not support the belief that the non-dominant hand plays a larger role than the dominant hand in bilateral artmaking. Therefore, assumptions concerning why bilateral artmaking is effective, that it is the inclusion of the non-dominant hand in artmaking which activates both hemispheres of the brain, as observed in brain research (Gut et al., 2007), are not supported. Thus, the mechanism by which bilateral artmaking produces greater reduction in anxiety is still unclear.

These findings suggest a new theory, that the dominant hand provides a level of control, helping to guide the non-dominant hand during bilateral artmaking, thereby easing participants' anxiety that use of the non-dominant hand induces. Additionally, the bilateral artmaking may have been more engaging of the body as a whole, creating a bottom-up process that grounded participants in their bodies rather than in their minds (ETC; Lusebrink & Hinz, 2016). In the non-dominant hand condition, use of this hand alone could have created anxiety for participants who struggled with control of the materials. This might have dampened the anxiety-reducing effects

of artmaking. The lack of control could have created discomfort and led participants to focus more on thought, perhaps contributing to rumination about being unsuccessful with the art experience.

Within the non-dominant hand drawing condition, one participant seemed a bit uncertain throughout the session. Before the artmaking, this individual was observed putting aside the pretest materials and had to be reminded to complete the second form before returning it to the researcher. This participant also misinterpreted the scribble drawing instructions by creating a symbolic image. Along with the above challenges, their artwork as seen in Figure 2 suggests increased anxiety as exhibited by tense and shaky line quality as well as the implied energy regarding how the colors were applied to the paper (as suggested by Gantt, 2001). Other indicators of anxiety in the imagery include the tree that appears to be floating in water as it is not clear where the roots of the tree are (suggesting a lack of grounding which is often experienced with anxiety). This participant reported moderate levels of anxiety on the GAD-7 and had an increase in anxiety pre- to post-test, the largest increase in the sample. The symbolic imagery is an example of how this participant may have been ruminating in their mind rather than grounded in their body, producing a more cognitive-symbolic artwork as described by the ETC (Lusebrink & Hinz, 2016).

In contrast, a second participant in the non-dominant hand drawing condition had the highest decrease in anxiety pre- to post-test across all conditions and reported severe levels of anxiety on the GAD-7. This participant was pregnant and remarked that their anxiety was due to being far along in the pregnancy. The participant also shared while artmaking, “Every time I do this kind of stuff, it reminds me I should color more.” This suggests that the participant had an awareness of how artmaking can induce relaxation, as supported by Czamanski-Cohen and

Weihs (2016). After the debriefing, this participant also stated, “I found my colors getting lighter as I relaxed more,” supporting the initial feelings related to creative activity. This is also visible in the artwork (Figure 3), as this participant had originally begun with the colors black and red and ended with lighter colors of yellow, orange, and blue.

A participant in the dominant hand condition who reported moderate levels of anxiety on the GAD-7 had the highest decrease in anxiety for that condition. Using light green, this individual began the artmaking by moving the oil pastel in large circular motions throughout the page (Figure 4). They applied yellow with more pressure at the center of the page and then appeared to border the page with blue and red. This border could have served as a container for anxious energy the participant was feeling while artmaking. This participant then returned to making large circular motions with the oil pastels and sat down shortly past halfway through the artmaking as if their level of energy had changed to a more relaxed state. The participant spent the rest of the time muting the bold colors with a white oil pastel, which could be suggestive of a desire to self-soothe.

The dominant hand drawing condition also included a participant who reported mild levels of anxiety on the GAD-7 and showed a small increase in anxiety pre- to post-test. This increase in state anxiety may have been due to the 10-minute time limit which caused this participant “anxiety” as they felt the directions to be a constraint or an assumed “challenge” rather than a guideline. Instead, this complaint may have been displacement of a more overwhelming feeling. It is further suggested in their artwork (Figure 5) the metaphor of a wound or some type of opening or area of importance potentially showing some unconscious traumatic material had surfaced. Furthermore, the additional colors that overlap the wound symbol were created using increased pressure and suggest an attempt to cover over or protect the psyche. Use

of the dominant hand may have allowed access to stored memory (Gantt & Tinnin, 2009), which became overwhelming for this participant. Rather than experience a strong emotional response to the artwork, this participant may have felt more secure criticizing the directions. It is also likely this inner, nonverbal experience was displayed in the changed scores.

One participant in the bilateral condition, who reported mild anxiety levels on the GAD-7, also had the highest increase in anxiety for that condition. The participant began the artmaking by making pressured balloon-like shapes on both sides of the page (Figure 6). After a moment of applying more lines, the participant paused and commented, “This is sad - like a clown crying. I don’t like this!” A border was added around the initial clown face, which could be indicative of the participant’s attempt to contain the anxious response they were having to the symbolism. The participant then stated, “I should add a few hearts here to cover this up,” and added three heart symbols down the center of the page using blue and red with heavy pressure. Unlike the participant (Figure 4) in the dominant hand condition who likely eased their anxiety by incorporating a border, this participant’s anxiety likely increased not only due to the symbolism, but also from the body’s response involved in making the artwork. Although art can be transformative to the psyche and reveal unconscious trauma, it seems that this participant may have needed to redefine an unknown trauma through the top-down process of artmaking (ETC; Lusebrink & Hinz, 2016).

The most relevant finding in this study (that supports a developing theory) was illustrated by the data and artwork made by a participant in the bilateral drawing condition who reported moderate levels of anxiety on the GAD-7 but had the highest decrease in anxiety pre- to post-test for that condition (Figure 7). The participant began using black and green with both hands on the right side of the page and then used the colors blue and red on the left side of the page. Perhaps

this color change was used as a way to self-soothe due to the experienced anxiety that was reported. More importantly, the motion of the arms and shoulders and the strong pressure applied with the materials were akin to working with clay, providing full-body engagement. The participant also stood with hands close together for most of the artmaking process. This motion resembled the act of wedging clay, which likely provided a somatic release of any pent-up anxiety that was reported. Unlike the pressure that appeared to create anxiety in other participant drawings (see Figures 5 and 6), this pressure seemed to have the opposite effect and likely relieved anxiety because of the kinesthetic movement (Lusebrink & Hinz, 2016).

These results might suggest that while art therapy treatment is useful for working through upsetting metaphors and symbols, individuals with mild anxiety levels may need additional guidance in tapping into and engaging their bodies through artmaking. It seems the participants in this study who experienced more moderate to severe anxiety found ease in engaging with the artmaking, possibly separating the physical responses of fear and panic from the cognitive responses of worry and rumination, as described in neuroimaging studies (Engel et al., 2009). This would be especially important to note in trauma-based art therapy, where clients may have less access to verbal communication processes (Gantt & Tinnin, 2009; King, 2016). Some clients, particularly those with lower levels of reported anxiety may still need time before being invited to challenge their control using the non-dominant hand so as not to increase anxiety levels.

The artmaking timeframe was only 10 minutes. This short timeframe may have made it difficult for participants to truly sense the effects of the artmaking, pointing to the need to increase the time devoted to artmaking. Additionally, many participants expressed having neck and back pain while looking down while drawing. Discomfort with position of the body while

artmaking may have dampened anxiety reduction. Future research could include using taller tables or drawing boards on easels and asking participants to stand to help ease neck and body stiffness. Further, a combination of body movement with the artmaking could promote range of motion, thereby tapping further into the kinesthetic benefits of art therapy.

Reconsideration of the directive is warranted. Some participants interpreted the directions given to fill as much of the page as possible as being a part of what was being assessed, and they expressed that this created more anxiety for them as they felt like they were expected to fulfill a timed challenge. A few participants misinterpreted what a scribble drawing is and drew landscapes through a series of scribbles. More explicit directions that the imagery does not have to represent anything nor fill the page would help to address these issues.

A limitation of the current research is that many of the groups that formed included individuals who knew each other, which created a lot of crosstalk as well as commentary on one another's artwork. Perhaps with more time to gather participants, the formation of more randomized groups would lessen or eliminate the amount of crosstalk during sessions. Another limitation is the sample size. A larger sample might have resulted in more power to achieve statistical significance. Additionally, this sample is not generalizable due to its small size. It should also be noted there were not enough self-identified left-handed participants to examine the impact of handedness on the outcomes. The sample consisted of all self-identified right-handed participants, with only one left-handed participant whose data was removed from the analysis for consistency. A proposed solution would be to recruit participants in nearly equal amounts of right and left-handed people and either have a randomized mix in each condition or change the research design to have six separate conditions.

Because all conditions experienced some decrease in anxiety after artmaking, results are consistent with literature that shows artmaking by way of art therapy is effective in treating anxiety symptoms (Czamanski-Cohen & Weihs, 2016; Gantt & Tinnin, 2009). While the theory of the role of the non-dominant hand in bilateral artmaking was not supported by the results, the findings do provide further evidence of the benefits of artmaking and specifically evidence for the greater effect of bilateral artmaking, not previously experimentally tested. Future research should seek to replicate these findings as well as examine other possible mechanisms for the added benefit of bilateral artmaking.

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Table 1

Descriptive Statistics for Scales Pre- and Post-Intervention

Scale	<i>N</i>	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>
GAD-7	35	0.00	18.00	6.54	4.72
SAS Pretest	35	21.00	55.00	34.00	7.16
SAS Pretest Index	35	26.25	68.75	42.50	8.95
SAS Post-Test	35	23.00	53.00	32.40	6.15
SAS Post-Test Index	35	28.75	66.25	40.50	7.68

Note. The SAS pre- and post-test scores are calculated using the sum of scores (Σ) across items.

The SAS pre- and post-test Index scores ($(\Sigma/80) * 100$) are calculated to determine if participants have clinically significant anxiety symptoms.

Table 2

Paired Samples t Test Anxiety Reduction Results Across Artmaking Conditions

Scale by Condition	M	SD	T	df	p	d
Dominant						
SAS Pretest	34.27	8.51				
SAS Post-Test	32.64	8.18				
Paired Differences	1.63	3.11	1.75	10	.056	0.53
Non-Dominant						
SAS Pretest	32.92	6.93				
SAS Post-Test	31.67	5.63				
Paired Differences	1.25	4.45	0.97	11	.176	0.28
Bilateral						
SAS Pretest	34.83	6.51				
SAS Post-Test	32.92	4.83				
Paired Differences	1.92	3.55	1.87	11	.044	0.54

Note. All tests are one-tailed.

Table 3

Descriptive Statistics for One-Way ANOVA of Decrease in Anxiety by Art Condition

Condition	<i>n</i>	<i>M</i>	<i>SD</i>
Dominant	11	-1.64	3.11
Non-Dominant	12	-1.25	4.45
Bilateral	12	-1.92	3.55

Note. Differences among groups is not significant.

Figure 1

Pre- and Post-Test Anxiety for Each Artmaking Condition

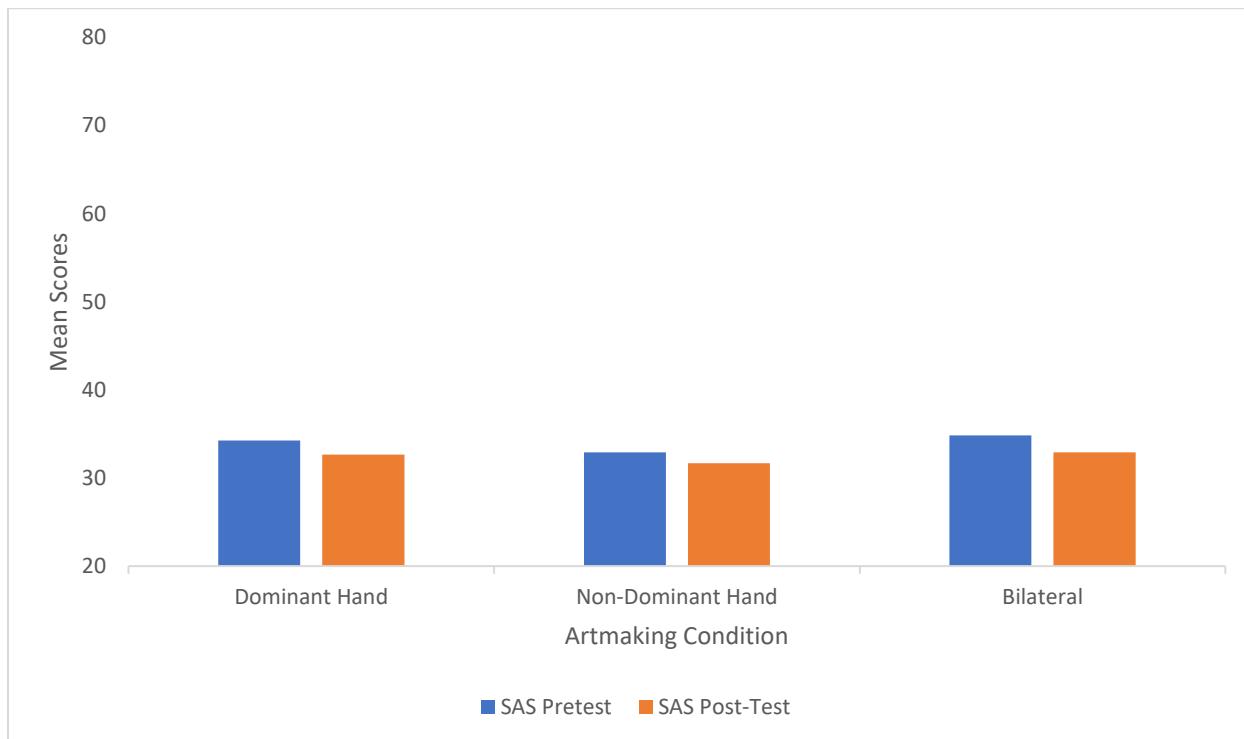
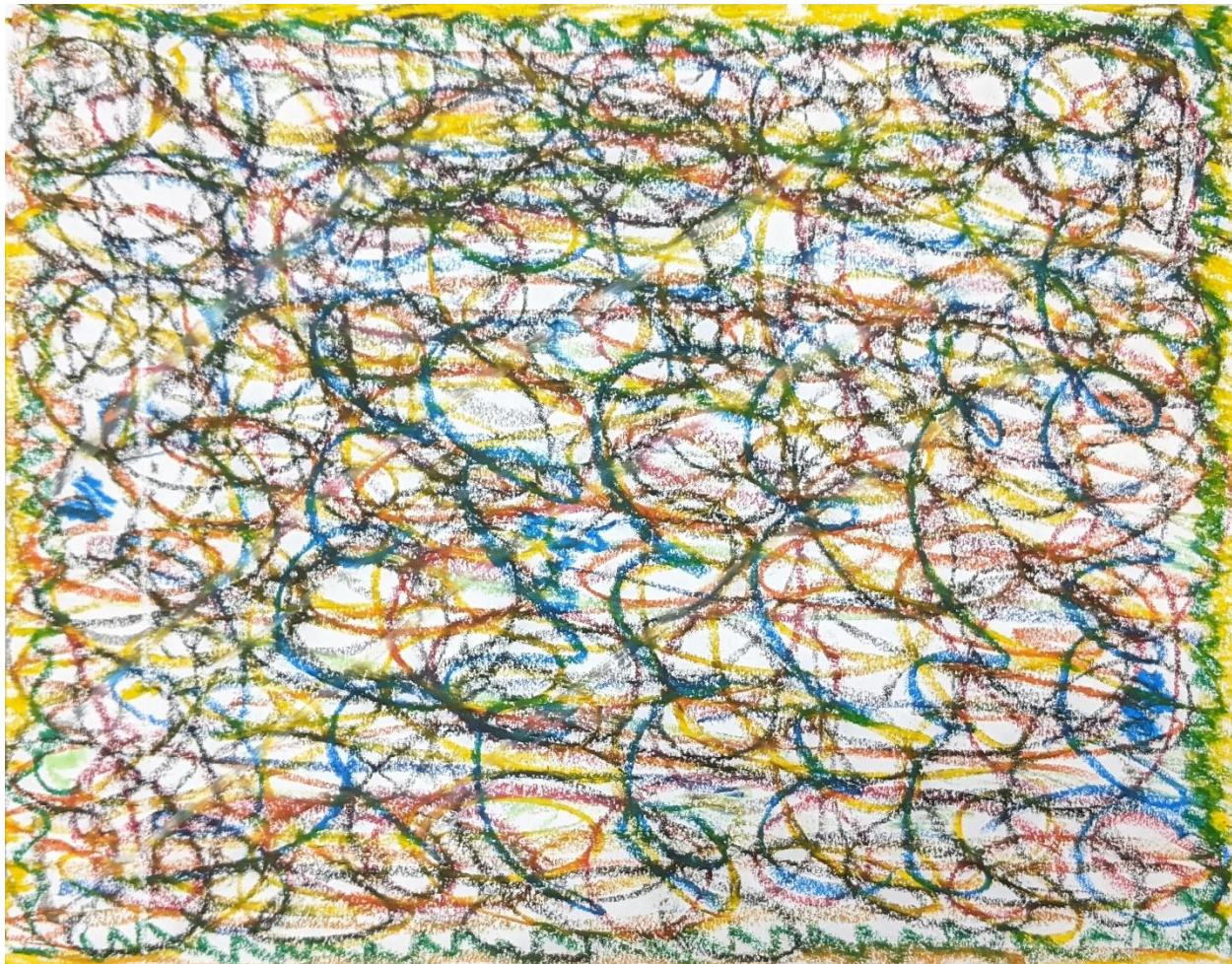


Figure 2*Symbolic Scribble Drawing Using Non-Dominant Hand*

Note. This participant in the non-dominant hand drawing condition is an 18-year-old Black Latinx woman who reported moderate levels of anxiety on the GAD-7 and increased anxiety pre-to post-test. Their artwork suggests increased anxiety exhibited by tense and shaky line quality as well as a lack of grounding implied by the tree floating in water.

Figure 3*Scribble Drawing Using Non-Dominant Hand*

Note. This participant in the non-dominant hand drawing condition is a 33-year-old Black woman who reported severe levels of anxiety on the GAD-7 and decreased anxiety pre- to post-test. Their artwork demonstrates a decrease in anxiety through the transition from dark colors like black and red to lighter colors like yellow, orange, and blue.

Figure 4

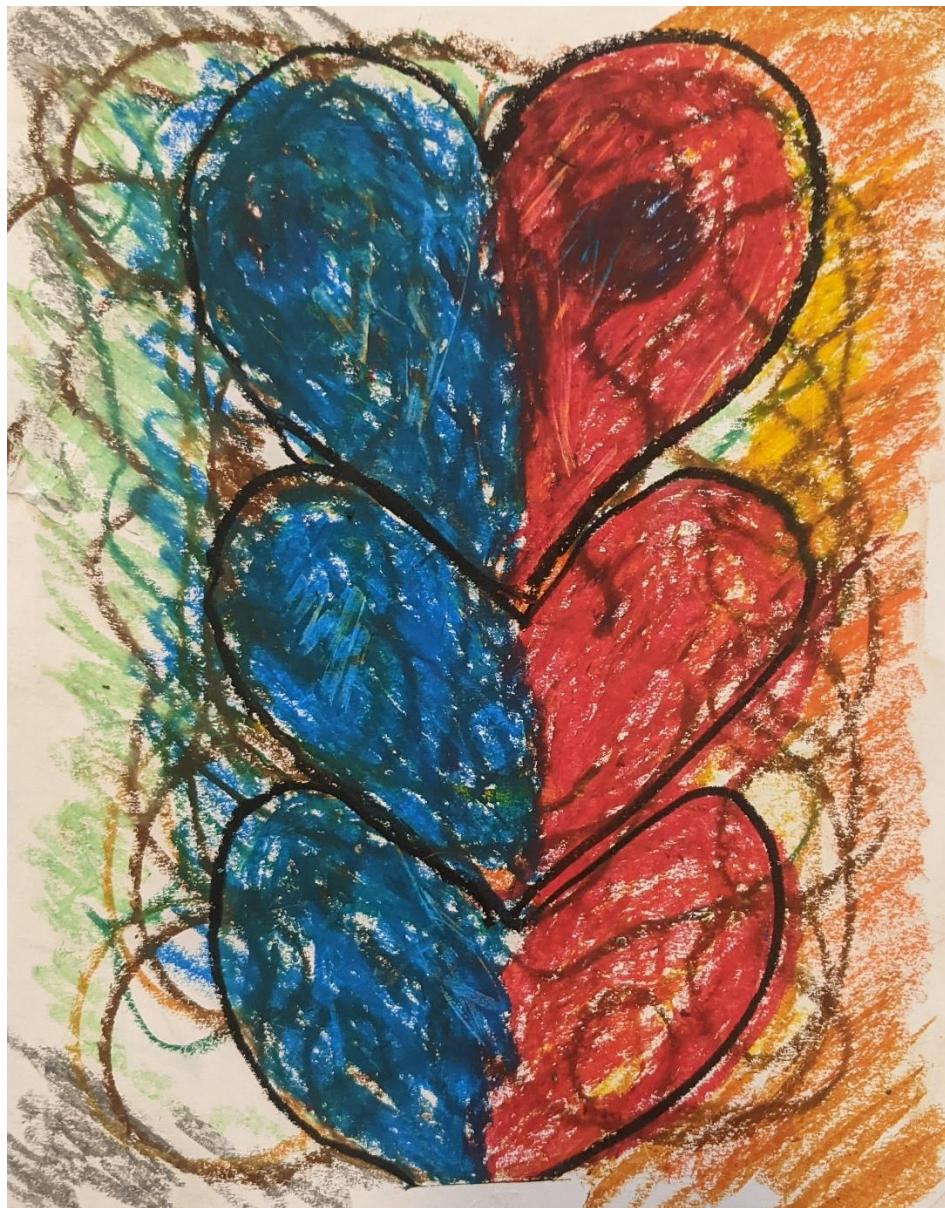
Scribble Drawing Using Dominant Hand



Note. This participant in the dominant hand drawing condition is a 25-year-old White woman who reported moderate levels of anxiety on the GAD-7 and decreased anxiety pre- to post-test. Their artwork shows the addition of a border which could have helped contain anxious energy in early artmaking while the larger circular motions likely engaged and relaxed their body to the point of sitting down halfway through.

Figure 5*Symbolic Scribble Drawing Using Dominant Hand*

Note. This participant in the dominant hand drawing condition is a 35-year-old White woman who reported mild levels of anxiety on the GAD-7 and increased anxiety pre- to post-test. Their artwork suggests metaphor of an unconscious “wound” or trauma that likely provoked an anxious response, that they then may have attempted to cover up or protect the psyche through increased line pressure.

Figure 6*Symbolic Scribble Drawing Using Both Hands*

Note. This participant in the bilateral drawing condition is a 26-year-old Hispanic/Latinx man who reported mild levels of anxiety on the GAD-7 and increased anxiety pre- to post-test. Their artwork suggests an attempt to contain and redefine upsetting symbolic imagery by adding borders and the three heart symbols covering a sad clown face.

Figure 7

Scribble Drawing Using Both Hands



Note. This participant in the bilateral condition is a 20-year-old Hispanic/Latinx man who reported moderate levels of anxiety on the GAD-7 and decreased anxiety pre- to post-test. Their artmaking process demonstrated full-body engagement of the materials, akin to wedging clay, that likely provided a somatic release of pent-up anxiety.

Appendix A**Recruitment Flyer**

Appendix B

Informed Consent Form

Informed Consent Form

This study is being conducted as part of the requirements for the completion of the Master of Arts in Art Therapy and Counseling degree at Albertus Magnus College. The purpose of this study is to investigate the effects of artmaking.

During this study you will be asked to complete a demographic form and questionnaires on how you feel and take part in an artmaking activity. Participation in this study is confidential and is expected to take approximately 40 minutes. Any discussion and artwork will remain private and confidential without the use of your name. The design of the study requires that the researcher hold onto the artwork, however it can be returned to you at a later date. Please note that art abilities are not a factor and will not be considered.

This is a completely voluntary study and if for any reason you would no longer like to participate, you are welcome to withdraw at any time. There are no major anticipated risks for participating in this study other than possibly experiencing mild discomfort about your artmaking, answers on the questionnaires, or in being observed. Benefits of this study may include enjoying artmaking, potential relaxation, and an opportunity for self-expression, as well as feeling good about helping a graduate student with their thesis requirement and contributing to research in the field of art therapy. The Institutional Review Board (IRB) at Albertus Magnus College has approved this study.

Please inform the researcher if you have any allergies to art materials. If you have any questions or concerns about this study, you may contact the following individuals:

The Investigator:
Marissa E. Ferrao
meferrao@albertus.edu

Art Therapy Advisor:
Rebecca Arnold, Ph.D., ATR-BC, CLAT
rarnold@albertus.edu

Psychology Advisor:
Hilda Speicher, Ph.D.
hspeicher@albertus.edu

Or:

IRB Administrator: Joshua Abreu, Ph.D., jabreu1@albertus.edu

Your signature below indicates that you are at least 18 years of age, have read and understand the description of the study, have had all your questions addressed, and are willing to participate.

Name (print): _____

Signature: _____ Date: _____

____ I received a copy of this form for my record

Appendix C

Art Image Release Form

Art Image Release Form

The investigator will photograph your artwork as part of the research study. Please note that the artwork that you create during this study will remain confidential. Photographs of the artwork will only be shown for educational purposes to those outside the research team with your consent for the purposes listed below and will not contain any identifying information.

Please check off your preference below in regard to showing photos of your artwork:

- I agree that photographed images of my artwork can be used for educational purposes including publications, presentations at professional conferences, or for training purposes.
- I agree that photographed images of my artwork can be used for educational purposes including presentations at professional conferences or for training purposes, but not for publications.
- I agree that photographed images of my artwork can be used for educational and training purposes.
- I do not give permission for photographs of my artwork to be shown for any of the above purposes.

I hereby give consent as noted above for use of my photographed artwork.

Name (print): _____

Signature: _____ Date: _____

____ I received a copy of this form for my record

Please note that once images have been disseminated publicly, they may be difficult or impossible to obtain should you change your mind.

Appendix D**Demographics Form****Demographics Form**

- 1) Please indicate your age: _____
- 2) How do you currently identify your gender? (Select all that apply)
 - Man
 - Woman
 - Non-binary
 - Genderqueer
 - Transgender
 - Self-Describe: _____
 - Prefer not to indicate
- 3) How do you currently identify your race/ethnicity? (Select all that apply)
 - African American/Black
 - Asian/Asian American
 - Hispanic/Latinx
 - Native American/Indigenous American
 - Native Hawaiian/Pacific Islander
 - White/Caucasian
 - Self-Describe: _____
 - Prefer not to indicate
- 4) Do you ever make art? If no, please skip question 5.
 - Yes, I make art.
 - No, I never make art.
- 5) If you answered yes to question 4, please indicate how often you create any form of art:
 - I frequently make art.
 - I occasionally make art.
 - I rarely make art.
- 6) Which hand do you prefer to use when writing or artmaking?
 - Right-hand dominant
 - Left-hand dominant
- 7) When growing up, did anyone ever force you to use a specific hand as dominant?
 - Yes, I was forced to use my right hand.
 - Yes, I was forced to use my left hand.
 - No

Appendix E

Debriefing Form

Debriefing Form: Handedness, Artmaking, & Anxiety Study

This form is intended to educate you about the goals of this study. This study was conducted to explore the effects of using one's non-dominant hand in bilateral artmaking on anxiety. Bilateral artmaking is using both hands to create artwork. For this study, participants were randomly assigned into a dominant hand drawing group, a non-dominant hand drawing group, and a bilateral drawing group. Anxiety measures were used to measure your level of anxiety.

While engagement is expected to be beneficial for all conditions, it is hypothesized for this study that anxiety should be reduced to a greater extent in participants who make art with their non-dominant hand as well as those in the bilateral condition compared to those using only their dominant hand. It is also hypothesized that there will be no significant difference in change of anxiety levels between participants in the non-dominant hand group and the bilateral group.

Please do not let others know about the details of the study. If participants have this knowledge prior to participation, it could skew the responses to the measure.

If you wish to access more information about this topic, here are some sources:

McNamee, C. (2004). Using both sides of the brain: Experiences that integrate art and talk therapy through scribble drawings. *Art Therapy*, 21(3), 136-142.
<https://doi.org/10.1080/07421656.2004.10129495>

McNamee, C. (2006). Experiences with bilateral art: A retrospective study. *Art Therapy*, 23(1), 7-13. <https://doi.org/10.1080/07421656.2006.10129526>

If you are experiencing any residual anxiety or discomfort after this study, here is a resource that may help you relax:

Calming Techniques Video:
<https://www.youtube.com/watch?v=odADwWzHR24>

If you would like to be notified of the results of this study, please email the graduate student researcher, Marissa E. Ferrao, at meferrao@albertus.edu. The researcher can only provide aggregate results, not individual outcomes.

Thank you for your voluntary participation in this study! Your time is truly appreciated.